

nection with the post of lecturer to the Committee. There is a difficulty in obtaining a competent man at the salary originally decided upon.

THE Technical Education Committee of the Berkshire County Council have advised the Council to establish four agricultural exhibitions of the value of £35 each, to be open to boys between fourteen and sixteen, and tenable for two years at the Dauntsey Agricultural School, which has been established to give a thoroughly practical instruction in the various branches of farm work.

THE Committee of Graduates of the University of London unanimously resolved, at a recent meeting:—"That the Committee of Graduates of the University of London in favour of the scheme of Lord Cowper's Commission, express the earnest hope that her Majesty's Government will again introduce a Bill for the creation of a statutory commission for the reconstitution of the University of London, and assure the Government that such a measure will have their active support."

THE Chairman of the Leicestershire Technical Education Committee informed the County Council, at their meeting on the 3rd inst., that at the present time there was not a single student from Leicestershire at the Midland Dairy Institute, though there were as many as forty last spring. This is owing to the fact that Leicestershire only interests itself in the practice of cheese-making, which cannot be satisfactorily carried out in the winter. But since there are so many branches of agriculture which can be properly studied during the winter months, it seems a misfortune that Leicestershire should reap no advantage from its contributions to the support of the Dairy Institute during so large a part of the year.

THE following are among recent appointments:—Dr. Johann Rückert to be professor of anatomy in the University of Munich; Dr. Liznar to be professor of meteorology and terrestrial magnetism in the Technical High School at Vienna; Dr. R. Schüssler to be professor of geometry in the Technical High School at Graz; Dr. C. J. Martin to be provisionally the successor to Dr. G. B. Halford as professor of physiology in the University of Sydney; Dr. Arnaldo Maggiora to be professor of experimental hygiene in Modena University; Dr. A. Serafini to be professor of experimental hygiene in the University of Padua. Among recent calls are:—Dr. Felix Auerbach, of Jena, to be professor of physics at Strasburg; Dr. Franz, assistant in the Observatory of Königsberg, to be associate professor of astronomy at Breslau.

It is announced in the *Lancet*, that the present Lord Rector of the University of St. Andrews—the Marquis of Bute—has undertaken to erect at his own cost, under certain conditions, four new laboratories, lecture-rooms, museums, work-rooms, &c., for the departments of anatomy, physiology, materia medica, and botany. These laboratories will be provided with all modern appliances for teaching and research purposes. They will form a most important addition to the existing natural philosophy, natural history, and chemical departments. As the laboratories are to be built apart from the existing colleges on ground of their own, they will, of necessity, form the headquarters of the extended medical school there, which school will henceforth be known as the "Bute School of Medicine," in commemoration of the generous donour.

AT a recent meeting of the Senate of the University of Wales, the question of fellowships, scholarships, exhibitions and prizes, to be established in connection with the University, was again discussed. The Senate recommended that there should be four fellowships of at least £100 per annum, tenable for two years, with possible renewal for a third year in recognition of exceptional merit. The prizes will be open both to graduates and undergraduates, and will be awarded for excellence of attainment in departments of study recognised by the University. The fellowships, scholarships, and exhibitions will be confined to graduates of the University. Fellowships will be only conferred for very distinguished merit, and will be tenable on condition of residence at some approved seat of learning or research, and on the active pursuit of original investigation. They will be awarded by the Court on the recommendation of the Senate, the Senate acting on the recommendation of a small Standing Committee specially appointed for this purpose. The Standing Committee will require information as to the subjects of research or advanced study to which

candidates propose to devote themselves, and (in the event of their election) receive from time to time reports as to their work and progress.

WE are glad that the Prince of Wales has again shown his interest in the excellent work of the Technical Education Board of the London County Council, by presiding at the distribution of prizes and certificates on Friday last. The magnitude of the work of the Board is shown by the fact that the number of scholars and exhibitors who were elected in 1896 is 893, made up as follows:—5 senior county scholars; 70 intermediate county scholars; 588 junior county scholars; 18 schools of art scholars; 21 artisan art scholars; 95 junior artisan evening art exhibitors; 85 evening science exhibitors; 2 horticultural scholars; 9 domestic economy training scholars. The total pecuniary value of these scholarships and exhibitions amounts to about £40,000. The amount placed at the disposal of the Board for the coming year is £150,000. In the course of an address at the close of the presentation of the certificates, the Prince of Wales pointed out that the Technical Education Board has made grants to University College, King's College, and Bedford College, under such conditions as are calculated to place the highest technical teaching of these institutions within the reach of those students who could not otherwise afford to devote several of the best years of their lives to a course of University study. Under these conditions evening classes in certain subjects, especially in those connected with mechanical and electrical engineering, have been conducted on precisely the same lines as the day classes, and by the same professors and lecturers; and on Saturdays the professors have undertaken to give instruction in several classes to teachers, who thus enjoy the advantages of all the resources of the best University institutions.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, January 21.—"Experiments on Examination of the Peripheral Distribution of the Fibres of the Posterior Roots of some Spinal Nerves, Part II." By C. S. Sherrington, F.R.S., Holt Professor of Physiology, University College, Liverpool. Received November 12, 1896.

This paper is in continuation of one brought before the Society in 1892, and published in *Phil. Trans.*, vol. 184, B. The communication is divided into four sections. In Section I. the field of peripheral distribution of each root is described from the Vth cervical to the lower end of the brachial region. Particular attention was paid to the question of the skin-fields of the several divisions, ophthalmic, maxillary, and mandibular of the cranial Vth, in order to see if the fields possessed the characters of segmental skin-fields, or those of peripheral nerve-trunk skin-fields. They were found to conform with the latter, not with the former. A curious relation of the posterior edge of the field of the Vth to the external ear is found to exist, indicating that the position of the visceral cleft is still adhered to as a boundary line for the field of the trigeminus. The sense of taste as well as of touch is found to be destroyed in the anterior two-thirds of the tongue after intracranial section of the Vth; this makes it extremely doubtful whether the corda tympani can have gustatory functions in the monkey, as has been believed in some cases in man. No loss of eye-movements, or interference with them, has been found to result from intracranial section of the Vth.

After cranial Vth and all the upper cervical posterior roots have been severed, there still persists a small field of sentient skin, which includes the external auditory meatus and a part of the pinna. This field, although not corresponding to the situation given by anthropotomists to the distribution of the auricular branch of the vagus, may come either from it or the glossopharyngeal. It presents interest as being the only field representing the whole cutaneous distribution of a nerve, which does not conform with the rules of zonal distribution holding good in the case of each of the other nerve-roots examined, and these now include the whole craniospinal series. The posterior root of the 1st cervical nerve has a skin-field in the cat, which includes the pinna. The posterior root of the same nerve in *Macacus* has no skin-field at all, its skin field having apparently been included in the IIrd cervical of *Macacus*, not in the cranial Vth. The root fields contributing to the surface of the brachial limb are IIIrd, IVth, Vth, VIth, VIIth, and VIIIth cervical,

and Ist, IInd, and IIIrd thoracic. Of these, the VIIIth cervical is the only one which includes the whole of the surface of the free apex of the limb; its distribution in this respect closely resembles that of the VIth lumbar sensory root in the pelvic limb.

The IInd section of the communication deals with the degree of conformity between the distribution of the spinal ganglion fibres in the skin and their distribution in the underlying deep tissues of the limb. It is shown that, although the *skin* fields of the ganglia are in the middle of the limb region dislocated from the median line of the body, the fibres of the root ganglion are nevertheless, when their deep distribution is taken into account, distributed to a complete ray of tissue extending in an unbroken fashion from the median plane of the body out along the limb to (in the case of the nerves, extending furthest into the limb) the very apex of it. This distribution conforms, therefore, with that shown in a previous paper to be typical of the distribution of the ventral (motor) root. The distinction is not, therefore, as between *afferent* and *efferent*, but as between *cutaneous* and *muscular*. A detailed analysis of the distribution of the deep sensory fibres is in this paper carried out for the VIth lumbar spinal ganglion of *Macacus rhesus*; this ganglion was chosen because its skin-field, occupying the free apex of the lower limb, is one as far dislocated from the median line of the body as any in the whole spinal series, and presents, therefore, the greatest apparent discrepancy between the distribution of its afferent and efferent roots. A comparison of the distribution of the afferent and efferent roots in this (VIth lumbar) nerve was made by means of the Wallerian method; the results show the peripheral distribution of the two to be minutely similar. From this, and from other observations given, the rule is put forward as a definitely established one that the sensory nerves of a skeletal muscle in all cases derive from the spinal ganglion (or ganglia) corresponding segmentally with that (or those) containing the motor cells, whence issue motor nerve-fibres to the muscle. The reflex arc, in which the afferent and efferent nerve-cells innervating a muscle are components, need not, therefore, as far as anatomical composition is concerned, involve irradiation through more than a single spinal segment.

Section III. deals with general features of arrangement recognisable in the distribution of the roots.—Comparison between the human brachial plexus and that of *Macacus* is made, and it is pointed out that the human plexus is slightly prefixed, as compared with that of *Macacus*.

Finally, in Section IV., various spinal reactions are examined, especially with reference to their effects upon the size and other features of the areas of the root-fields, &c., and the results collated and discussed.

“Cataleptoid Reflexes in the Monkey.” By C. S. Sherrington, F.R.S., Holt Professor of Physiology, University College, Liverpool. Received December 29, 1896.

The reflex movements, the subject of this note, are of extremely prolonged duration, and absolutely devoid of clonic or alternating character. If the cerebral hemispheres be removed *e.g.* from a monkey, and if a finger of one of the monkey's hands be stimulated, for instance, by dipping it into a cup of hot water, there results an extensive reflex reaction involving movement of the whole upper limb. The wrist is extended, the elbow flexed, the shoulder protracted, the upper arm being drawn forward and somewhat across the chest. The movement occurs after a variable and usually prolonged period of latent excitation. The movement, although it may be fairly rapid, strikes the observer each time as perfectly deliberate; it is of curiously steady and “smooth” performance. Sometimes it is carried out quite slowly, and then, as a rule, the extent of it is less ample. The most striking feature of the reflex is, however, that when the actual movement has been accomplished *the contraction of the muscles employed in it does not cease or become superseded by the action of another group, but is continued even for ten and twenty minutes at a time.* The new attitude assumed by the limb is maintained, and that too without clonus or even tremor. In the instance cited, namely, that of the fore limb, the posture assumed suggests the taking of a forward step in quadrupedal progression, and in that posture the animal will remain for a quarter of an hour at a time.

The degree of, for instance, flexion assumed in the new posture seems much dependent on the intensity and duration of the stimulus applied. If the degree is extreme, the attitude of the limb may not be maintained to its full extent for the time mentioned; thus, the elbow, at first fully flexed, will in the course

of a minute or so be found to have opened somewhat. This opening can be often seen to occur *per saltum*, as it were, but the steps are quite small, and recurrent at unequal intervals of between perhaps a quarter of a minute and a minute. After some relaxation from the extreme phase of the posture has taken place, the less pronounced attitude, *e.g.* semiflexion at the elbow, may persist without alteration obvious to inspection for ten minutes or more. Apart from the occasional step-like relaxations, the contraction of the muscles is so steady as to give an even line when registered by the myograph. A renewed stimulation of the finger excites further flexion, which is maintained as before in the way above described. The posture can be set aside without difficulty by taking hold of the limb and unbending it; the resistance felt in the process of so doing is slight; the posture thus broken down is not reassumed when the limb is then released.

Analogous results are obtainable on the hind limb. Hot water applied to a toe evokes always, so far as I have seen, flexion of ankle and knee; usually of hip also. This movement is “deliberately” executed, and always institutes a maintained posture.

Not the least interesting part of the reflexes under consideration is a remarkable glimpse which they allow into the scope of reflex inhibition as regards the coordinate of movements of the limbs. Although the posture taken up by the right fore limb consequent upon excitation of a finger is symmetrically duplicated by the left limb when both hands are simultaneously stimulated, the effect of excitation of the two hands does not lead to symmetrical posture if the excitation be not synchronous but successive. If when the right arm has already assumed its posture in response to an excitation of the right hand, the left hand be stimulated, there results, while the left arm in obedience to the excitation is lifted and placed in the flexed posture, an immediate and, if the stimulus be at all more than slight, complete relaxation of the right arm. The right arm drops flaccid, while the left is raised and maintained in the raised attitude. Similarly, excitation of the right foot breaks down the posture assumed by the right arm, and conversely, and even more easily, stimulation of the right hand breaks down a posture assumed by the right leg. Again, a nip of the right pinna causes relinquishment of a posture assumed by the right arm or by the right leg. If the right pinna is pinched when both arms are in this cataleptoid posture, complete inhibition can be readily exerted on the right arm, but usually only partial relinquishment can be induced in the left arm. To exert complete inhibition upon the posture of the left arm, the pinna pinched must be that of the left side. Similarly the posture reflexly evoked by appropriate stimulation of either hind limb can be inhibited by excitation of either pinna or of either fore limb, but predominantly by pinna and fore limb of the same side as the limb to be inhibited. The inhibition of the hind limb is much more easily elicited from the opposite hind limb than from the opposite fore limb or opposite ear. I have never yet seen it obtained diagonally upon the fore limb from the opposite hind limb.

February 4.—“On Lunar Periodicities in Earthquake Frequency.” By C. G. Knott, Lecturer on Applied Mathematics, Edinburgh University (formerly Professor of Physics, Imperial University, Japan). Received November 4, 1896.

General Conclusions.—The conclusions are summarised under eight heads.

(a) There is evidence that the earthquake frequency in Japan is subject to a periodicity associated with the lunar day.

(b) The lunar half-daily period is particularly in evidence, both by reason of its relative prominence and the regularity with which, in each of two groups of the several seismic districts, its phase falls in relation to the time of meridian passage of the moon.

(c) There is no certain evidence that the loading and unloading due to the flow and ebb of ocean tides have any effect on seismic frequency.

(d) Hence we must look to the direct tidal stress of the moon, in its daily change, as the most probable cause of a range in frequency which does not exceed 6 per cent. of the average frequency.

(e) There is distinct evidence, both as regards amplitude and phase, of a fortnightly periodicity associated with the times of conjunction and opposition of the sun and moon.

(f) No definite conclusion can be drawn from the apparent monthly and fortnightly periodicities which seem to be

associated with the periodic changes in the moon's distance and declination, for the simple reason that fully as prominent harmonic components exist when the statistics are analysed according to the periodic change in the moon's position relative to the *ecliptic*, and with this particular period no tidal stresses can be directly associated.

(g) Nevertheless, the value of the phase lends some support to the view that there is a real connection between the change in the moon's distance and earthquake frequency, since the maximum frequency falls near the time of perigee.

(h) These conclusions have, in comparison with previous similar investigations, a peculiar value, inasmuch as they are based upon accurate statistics of fully 7000 earthquakes occurring within eight years in a limited part of the earth's crust, throughout which the seismic conditions may be assumed to be fairly similar from point to point.

February 4.—“Some Experiments on Helium.” By Morris W. Travers. Communicated by Prof. W. Ramsay, F.R.S. Received December 30, 1896.

Geological Society, January 20.—Dr. Henry Hicks, F.R.S., President, in the chair.—On glacial phenomena of Palæozoic Age in the Varanger Fiord, by Aubrey Strahan. The Gaisa beds of the Varanger Fiord consist of slightly altered quartz-grits, with red sandstones and shales, and rest upon a deeply denuded surface of the metamorphic rocks. In a section, first noticed by Dr. Reusch, a heterogeneous mixture of grit and clay with boulders of granitic and other rocks is seen to be intercalated between the quartz-grits, the bedding of the overlying grit proving that this boulder-rock was contemporaneously formed, and not subsequently wedged in. The surface of the grit below the rock is characteristically glaciated. Proof was given that the striated surface is not the floor of a thrust-plane, and that the boulder-rock is not a fault-breccia or a crush-conglomerate, but a “till.” In the absence of fossils the Gaisa formation was doubtfully assigned to an early Palæozoic age. It exhibits the same sedimentary characters as the rocks of later date in other parts of the world in which glacial phenomena have been observed. The glacial episode was attributed to a temporary change of climate rather than to the high latitude in which the section lies.—The raised beaches and glacial deposits of the Varanger Fiord, by Aubrey Strahan. The raised beaches range up to nearly 300 feet above the sea. Though a number of impersistent shingle-banks occur at various heights, the highest is constant, and can be traced along the same level either as a shingly terrace or by a zone of wave-worn rocks. Evidence is furnished by the relative size of different parts of the beach that the prevalent wave-action was from the west, and by the greater abundance of erratics on or below the beach than above it, that floating ice was at work. At the head of the fiord a blue clay dotted over with stones is now being formed, and the raised beach there consists of a similar material. Both here and elsewhere this clay stimulates a boulder clay; but for reasons given it was believed to be a marine fiord-deposit, into which many stones have been dropped by floating ice. Deposits of true glacial age, in the form of mounds of gravel, were described, and shown to have yielded the material out of which parts of the raised beaches were formed. The glaciation of the fiord was attributed to floating ice, and was shown to have taken place before the formation of the raised beaches, at a time when the sea surrounded this part of Finmark, by way of the Varanger Fiord, the Tana Valley, and the Tana Fiord. In the discussion upon the two papers, the President congratulated the author on the admirable manner in which he had worked out the evidence produced from the Varanger Fiord, and on his being able to show so conclusively that the views put forward by Dr. Reusch were substantially correct. Sir Archibald Geikie referred to one or two difficulties in the interpretations adopted by the author, one of the most obvious being the striated pavement of quartzite below the boulder-bed. This difficulty, however, was not insuperable. With regard to the age of the Gaisa series, Sir Archibald Geikie remarked that he was inclined to adopt the view of Dr. Reusch, who compared this series with the sparagmite of Central and Southern Norway. He himself had seen the sparagmite *in situ*, and had been much struck with its general resemblance, both in scenery and in lithology, with the Torridonian rocks of north-west Scotland. It was, like those rocks older than the Cambrian system. Dr. J. W. Gregory pointed out that the previous failure to discover traces of glacial action

in high northern latitudes in pre-Pleistocene times gave wide interest to Reusch's paper; and the corroboration of his views by Mr. Strahan was of great value. He thought the deposits of special interest, as similar conglomerates occupying identically the same stratigraphical position occur all round the Polar basin, and in places where their age can be proved. In Spitzbergen the occurrence of the conglomerates was discovered last summer, and they are there pre-Devonian. Evidence seems to show that the conglomerates are probably part of a circumpolar belt. Mr. Hudleston corroborated the author's statements as to the nature of the country and of the arenaceous quartzite system prevailing in Eastern Finmark. Beyond the region shown in his map, on the eastern side of the Tana Fiord, the Staunges Fjeld rises rather steeply to heights probably reaching 3000 feet. This is a quartzite wilderness, almost as white as snow, having a strong external resemblance to the quartzite-mountains of the North-western Highlands; the system might thus include both Torridonian and basal Cambrian beds. The importance of the author's verification of Reusch's statements was very great. The late Dr. Croll had been desirous of obtaining evidences of glaciation in the several formations anterior to the great Ice Age. His failure to do so he attributed to the circumstance that the evidences of glaciation are to be found principally on land-surfaces, and that the transformation of a land-surface into a sea-bottom would in most cases obliterate all traces of glaciation. A striated bed-rock went much further in this direction than mere boulders and striated stones; and, as far as he (the speaker) knew, these occurrences on the Varanger Fiord were the only ones as yet established in the northern hemisphere, with some possible exceptions in the case of the Talchirs. For a grander exhibition of striated bed-rock they must look to the southern hemisphere: Prof. Edgeworth David had recently brought before the Society such evidence from Southern Australia, referred to the Permo-Carboniferous period.

Chemical Society, January 21.—Mr. A. G. Vernon Harcourt, President, in the chair.—The following papers were read: Observations on the properties of some highly purified substances, by W. A. Shenstone. The author shows that oxygen is far more readily ozonised when moist than when dry; the conversion of ozone into oxygen is greatly retarded by the presence of moisture. Carefully purified and dried chlorine combines readily with mercury, but is not condensed by a silent electrical discharge.—The action of diastase on starch, by A. R. Ling and J. L. Baker. Starch, when hydrolysed by diastase, is converted into a series of maltodextrins of gradually decreasing molecular weight and rotatory power and of increasing cupric reducing power.—The solution density and cupric reducing power of dextrose, lævulose and invert-sugar, by H. T. Brown, G. H. Morris, and J. H. Millar.—Derivatives of maclurin, Part II., by A. G. Perkin. Although maclurin yields no definite acetyl-derivatives, a triacetyl-derivative of maclurin-azobenzene can be prepared; similarly the azobenzene of phloroglucin yields a monoacetyl-derivative.—Halogen-substituted acidic thiocarbimides and their derivatives; a contribution to the chemistry of the thiohydantoins, by A. E. Dixon. By the action of primary or secondary amines on halogen-substituted thiocarbimides a number of substituted thiohydantoins have been prepared.—The amyl (secondary butyl-methyl) derivatives of glyceric, diacetylglyceric, and dibenzoylglyceric acids, active and inactive, by P. Frankland and T. S. Price. The authors have prepared a number of inactive and active amyl salts of substituted glyceric acids, and investigated the effect of temperature on their rotatory powers and the relations between the rotations.—The refraction constants of crystalline salts, by A. E. Tutton.—The refraction constants of crystalline salts: a correction, by W. J. Pope.—On the wide dissemination of some of the rarer elements and the mode of their association in common ores and minerals, by W. N. Hartley and H. Ramage. Out of 168 ores and minerals examined, 68 contained gallium, 30 contained indium, 17 contained thallium, and 70 probably contained rubidium; conclusions are drawn respecting the formation of beds and lodes of ore, and relations are found to exist between the periodic classification and the distribution of the elements.

Zoological Society, February 2.—Prof. George B. Howes in the chair.—Mr. Sclater exhibited a collection of bird-skins that had been formed by Mr. W. A. Churchill, H.B.M. Consul at Mozambique, during various shooting-excursions along the shores within twenty miles of the island of Mozambique.—Mr.

R. E. Holding, on behalf of Sir Douglas Brooke, Bart., exhibited a head and two pair of shed horns of a fallow deer. The latter showed curious deformities in consequence of disease of the frontal bone.—Mr. G. E. H. Barrett-Hamilton gave a short general account of his expedition to the Fur-Seal Islands of the North Pacific during the summer of 1896, in company with Prof. D'Arcy Thompson. This journey had been undertaken on behalf of the Foreign and Colonial Offices, with a view to the investigation of the natural history of the northern fur-seal (*Otaria ursina*), with special reference to certain disputed points which had a distinct bearing on the industry connected with the skins of the animal. A detailed report of Mr. Barrett-Hamilton's investigations would be issued as a Parliamentary Blue Book.—Mr. G. A. Boulenger, F.R.S., read a paper entitled "A Catalogue of the Reptiles and Batrachians of Celebes, with special reference to the collections made by Drs. P. and F. Sarasin in 1893-1896." This memoir gave a complete list (with descriptions) of all the reptiles and batrachians, with the exception of the marine species, known to occur in the Celebes. The number of species of reptiles enumerated was 83, and of batrachians 21.—Mr. Martin Jacoby contributed to our knowledge of the African fauna by describing 43 species of Phytophagous Coleoptera, 37 of which were new, based on specimens contained in collections sent home to him from Natal and Mashonaland by Mr. Guy A. K. Marshall, and from Madagascar by M. Alluand, of Paris.

CAMBRIDGE.

Philosophical Society, January 25.—Mr. F. Darwin, President, in the chair.—Some results obtained by staining the brain with the chrome-silver method (illustrated by photomicrographs), by Dr. A. Hill. Dr. Hill showed a granule of the olfactory bulb with a looped axis-cylinder, and also certain forms of granule of the cerebellum not hitherto described. He also exhibited sections and photographs showing the variations in the form of the "thorns" on the dendrites of nerve-cells, which can be produced by varying the hardening process: (1) The thorns may be absent; (2) they may be long or short; (3) they may have the typical form of a minute rod with a dot at the end, or the dots may be divided and lie on the course of the rod; (4) they may be replaced by long filaments.—A possible explanation of the quinqueloculine arrangement of the chambers of the microspheric forms of trilobine and bilobine shells of the miliolide (foraminifera), by Mr. J. J. Lister. It was suggested that the quinqueloculine mode of growth in the young microspheric forms of the miliolide may be ancestral and archaic.—On the theory of osmotic forces, by Mr. J. Larmor (will be printed in full).

MANCHESTER.

Literary and Philosophical Society, January 26.—Prof. H. B. Dixon, F.R.S., in the chair.—On a convection scope and calorimeter, by A. R. Bennett. Mr. Bennett described how he had devised a small and exceedingly sensitive motor which begins to revolve the moment it is exposed to daylight in the open air, whether the sun is shining or not, and which will also work all night in clear weather. The delicacy of the motor is such that it is affected by the radiant heat of moonlight. The motive power is due to convection currents caused by the radiant heat of daylight striking through a glass shade with which the instrument is covered; the glass is not heated, but the metal surfaces of the instrument are, and air is consequently expanded on the motor surfaces and condensed on the glass, the resulting difference of temperature setting up a convection current which does not cease so long as the instrument is exposed to the radiant heat due to visible rays. Descriptions were given of modifications by which surplus heat is automatically stored during the day and employed to drive the instrument at night. During the months of May, June, and July last, such a storage instrument continued in motion without stopping day or night; and in fine climates, like Egypt, much longer periods of continuous movement could undoubtedly be secured. The speed of the instrument is affected by barometrical pressure and hygroscopic conditions. It is capable of marking the dew-point, and works well even when its glass shade is completely coated with ice or half buried in snow. Mr. Bennett has succeeded in adapting the instrument to act as a calorimeter by first cooling the whole of the instrument to a given temperature, when rotation ceases, and then suspending pieces of heated metal inside. In this way the specific heats of substances can be accurately compared, since the number of rotations caused is in direct proportion to

the amount of introduced heat. The instrument can also be used to measure the comparative heat-retaining power of textile fabrics, boiler compositions, &c., and the relative heat conductivities of thin threads and wires. Mr. Bennett has also instituted a series of experiments, as yet incomplete, into the comparative sensitiveness to convection effects of various gases, which promise interesting results, since the differences already noted are unexpectedly great, and, moreover, do not bear any direct relation to the densities or other known physical properties of the gases tried.

PARIS.

Academy of Sciences, February 1.—M. A. Chatin in the chair.—The election of M. Filhol in the Section of Anatomy and Zoology, in the place of M. Sappey, was approved by the President of the Republic.—On a mode of inversion of multiple integrals, by M. Paul Appell.—On the integration of certain differential equations by series, by M. Émile Picard.—Further details on an apparatus for producing acetylene, by M. H. L. Lechappe.—On a scheme of night signalling on railways by phosphorescence, by M. A. Boullerot.—On a new instrument designed to show the upward or downward movement in balloons, by M. Aug. Coret.—Distance of the solar system, by M. E. Roger. A discussion of the two laws enounced by M. Delaunay. It is stated that the first law may be attributed to chance agreement, and that the second is a particular case of a more general law.—On the quadratic integrals of the equations of dynamics, by M. P. Painlevé.—On the laws of interest, by M. Enrico de Montel.—Generalisation of the formulæ of electromagnetism, by M. Vaschy.—On the molecular conductivity of salts in dilute solution, by M. P. Joubin.—On the radio-photography of the soft parts of man and animals, by MM. Remy and Contremoulin. Silver chromate is deposited by a preliminary chemical treatment on the surface, and in the tissues of the muscles. In this way photographs can be obtained by means of the Röntgen rays in which not only the muscles, but even the muscular bundles are clearly visible.—Structural isomerism and rotatory power, by MM. Ph. A. Guye and J. Guerschgorine. The results of an experimental study of the rotatory power of the amyl isovalerates, derived from the three isomeric valeric acids; of the propyl and butyl valerates, obtained from the active valeric acid; and of the propyl and butyl caproates, prepared with caproic acid obtained synthetically by the decomposition of active amyl-malonic acid. It is found that in all cases the normal propyl group behaves as though it were heavier than the isopropyl group, but that the isobutyl group appears to be heavier than the normal butyl group, whilst the latter, again, is heavier than the secondary butyl group.—Constitution of the combinations of antipyrin with phenols, by M. G. Patein. It is shown that monomethylphenyl-pyrazolone does not combine with phenols, and that the phenol is probably joined, in the case of the combination with antipyrin, to one of the nitrogen atoms.—On the estimation of lipase, the saponifying ferment in the blood, by MM. Hanriot and L. Camus. The estimation was carried out by measuring the amount of sodium butyrate formed by the saponification of butyrin during a fixed time. The activity of lipase prepared from the blood serum of the horse was shown by preliminary experiments to be unchanged after nearly two months' preservation; the temperature, however, exerts a considerable influence upon the results, and has to be kept constant during the determination.—On a new method of preparing anatomical specimens, by M. N. Melnikoff-Rasvédenkoff. The specimen is treated successively with a solution of formaline, alcohol (60 to 80 per cent.), and a solution made up of water (100), glycerine (20), and potassium acetate (15).—Separation of glycerine in wine by means of a current of steam, by MM. F. Bordas and Sig. de Raczowski. Test analyses are given showing the accuracy of the method.—Contribution to the study of the action of zinc upon red wines, by M. L. A. Levat. The amount of zinc taken up by the wine is sufficient to make the latter poisonous, and this metal should not be used for taps, or for containing vessels of any kind in which wines are stored.—Structure and mechanism of the bulb in the Mollusca, by M. Alexandre Amandrut.—On a method of mounting rotifers, by M. Nicolas de Zograf. The rotifers are narcotised with a solution of cocaine hydrochloride, and then treated with osmic acid. This is removed and replaced by weak crude wood vinegar, then the animals washed with water and dried by alcohol. The rotifers fixed in this way do not contract their abdominal appendages, cilia, or tentacles.—The *castoreum* of the roach, by

M. Jules Gal.—New researches on the *Amylotrogus*, by M. E. Roze.—The forms of the parasite of the black rot from autumn to spring, by M. A. Prunet.—On the effects of oil at sea, by M. Baregte. An account of the successful use of oil in breaking up large waves during a storm. It was found that for the oil to produce its maximum effect, the vessel must have a certain speed depending upon the state of the sea. For the case described a speed of eight knots was found to be the most favourable.—Relations between the masses of the solar system, by M. Delauney.—Note on some questions in celestial mechanics, by M. J. Mortij.

DIARY OF SOCIETIES.

THURSDAY, FEBRUARY 11.

ROYAL SOCIETY, at 4.30.—The Oviposition of *Nautilus macromphalus*: Dr. A. Willey.—Report to the Committee of the Royal Society appointed to investigate the Structure of a Coral Reef by Boring: Prof. Sollas, F.R.S.—The Artificial Insemination of Mammalia and subsequent possible Fertilisation or Impregnation of their Ova: W. Heape.—On the Regeneration of Nerves: Dr. R. Kennedy.
ROYAL INSTITUTION, at 3.—Problems of Arctic Geology: Dr. J. W. Gregory.
SOCIETY OF ARTS (Imperial Institute), at 4.30.—The Progress of Science Teaching in India: Prof. Jagadis Chundra Bose.
SOCIETY OF ARTS, at 8.—The Mechanical Production of Cold: Prof. James A. Ewing, F.R.S.
MATHEMATICAL SOCIETY, at 8.—A Theorem in Non-Euclidean Geometry: F. S. Macaulay.—On some General Theorems relating to Conics analogous to Simon's-Line Theorem: H. M. Taylor.
INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Electric Interlocking the Block and Mechanical Signals on Railways: F. T. Hollins.
CAMERA CLUB, at 8.15.—The Making and Exhibiting of Living Photographs: Birt Acres.

FRIDAY, FEBRUARY 12.

ROYAL INSTITUTION, at 9.—Recent Advances in Seismology: Prof. John Milne, F.R.S.
ROYAL ASTRONOMICAL SOCIETY, at 3.—Annual Meeting.
PHYSICAL SOCIETY, at 5.—Annual Meeting.—Note on the Use of very small Mirrors with Paraffin Lamp and Scale: Dr. H. H. Hoffert.—On the Thermoelectric Properties of Liquid Metals: W. Beckett Binnie.
INSTITUTION OF CIVIL ENGINEERS, at 8.—Cooling Reservoirs for Condensing Engines: Harold W. Barker.
MALACOLOGICAL SOCIETY, at 8.—Annual Meeting.

SATURDAY, FEBRUARY 13.

ROYAL INSTITUTION, at 3.—The Growth of the Mediterranean Route to the East: W. F. Lord.
ROYAL BOTANICAL SOCIETY, at 4.

MONDAY, FEBRUARY 15.

SOCIETY OF ARTS, at 8.—The Industrial Uses of Cellulose: C. F. Cross.
IMPERIAL INSTITUTE, at 8.30.—Sixty Years of Submarine Telegraphy: Prof. W. E. Ayrton, F.R.S.
SOCIETY OF CHEMICAL INDUSTRY, at 8.—Adjourned Discussion on Mr. W. J. Dibdin's Paper on the Character of the London Water Supply.
VICTORIA INSTITUTE, at 4.30.—Are Acquired Characters Inherited?

TUESDAY, FEBRUARY 16.

ROYAL INSTITUTION, at 3.—Animal Electricity: Prof. A. D. Waller, F.R.S.
SOCIETY OF ARTS, at 8.—The Progress of Canada during the past Sixty Years of her Majesty's Reign: Joseph G. Colmer, C.M.G.
ZOOLOGICAL SOCIETY, at 8.30.—On Echinoccephalus, a Halosauroid Fish from the Upper Cretaceous Formation of Westphalia: A. Smith Woodward.—On a Specimen of *Acanthocybium solandi* from the Arabian Sea: G. A. Boulenger, F.R.S.—Remarks on the Existing Forms of Giraffe: W. E. de Winton.
INSTITUTION OF CIVIL ENGINEERS, at 8.—Paper to be further discussed: Cold Storage at the London and India Docks: H. F. Donaldson.
ROYAL STATISTICAL SOCIETY, at 5.30.—English Vaccination and Small-pox Statistics; with special reference to the Report of the Royal Commission, and to recent Small-pox Epidemics: Noel A. Humphreys.
ROYAL PHOTOGRAPHIC SOCIETY, at 8.

WEDNESDAY, FEBRUARY 17.

SOCIETY OF ARTS, at 8.—Light Railways: Everard R. Calthrop.
ROYAL METEOROLOGICAL SOCIETY, at 7.30.—Report on the Phenological Observations for 1896: Edward Mawley, President.—Results of Observations on Haze and Transparency near Haslemere, Surrey: Hon. F. A. Rollo Russell.
ROYAL MICROSCOPICAL SOCIETY, at 8.—On a Simple Method of Microphotography: G. M. Giles.
ENTOMOLOGICAL SOCIETY, at 8.

THURSDAY, FEBRUARY 18.

ROYAL SOCIETY, at 4.30.—The following Papers will *probably* be read:—On the Iron Lines present in the Hottest Stars (Preliminary Note): J. N. Lockyer, F.R.S.—On the Significance of Bravais' Formulae for Regression, &c., in the case of Skew Variation: G. U. Yule.—Mathematical Contributions to the Theory of Evolution. On a Form of Spurious Correlation which may arise when Indices are used in the Measurement of Organs: Prof. K. Pearson, F.R.S.—Note to the Memoir of Prof. Karl Pearson, F.R.S., on Spurious Correlation: F. Galton, F.R.S.
ROYAL INSTITUTION, at 3.—Problems of Arctic Geology: Dr. J. W. Gregory.
SOCIETY OF ARTS, at 8.—The Mechanical Production of Cold: Prof. James A. Ewing, F.R.S.
LINNEAN SOCIETY, at 8.—On certain Points in the Anatomy and Morphology of the Nymphæacæ: D. T. Gwynne Vaughan.—The Adhesive Discs of *Ercilla spicata*, Uog: T. H. Burrage.

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CHEMICAL SOCIETY, at 8.—The Oxidation of Sulphurous Acid by Potassium Permanganate: T. S. Dymond and F. Hughes.—Sodamide and some of its Substitution Derivatives; also Rubidamide: Dr. A. W. Titherley.
CAMERA CLUB, at 8.15. Practical Use of X-Rays: Sydney Rowland.

FRIDAY, FEBRUARY 19.

ROYAL INSTITUTION, at 9.—The Approaching Return of the Great Swarm of November Meteors: Dr. G. Johnstone Stoney, F.R.S.
GEOLOGICAL SOCIETY, at 3.—Annual Meeting.
EPIDEMIOLOGICAL SOCIETY, at 8.

SATURDAY, FEBRUARY 20.

ROYAL INSTITUTION, at 3.—Growth of the Mediterranean Route to the East: W. F. Lord.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

BOOKS.—Is Natural Selection the Creator of Species?: D. Graham (Digby).—Everybody's Guide to Photography: "Operator" (Saxon).—Everybody's English Song-Book: "Basso" (Saxon).—Star Atlas: Prof. W. Upton (Ginn).—Calendar, &c., of the Department of Science and Art, 1897 (Eyre).—Bacteria of the Sputa and Cryptogamic Flora of the Mouth: Dr. F. Vicentini, translated by Rev. E. J. Stutter and Prof. E. Saieghi (Baillière).—Les Succédanés du Chiffon en Papeterie: V. Urbain (Paris, Gauthier-Villars).—Projectiles de Campagne de Siège et de Place. Fusées: E. Vallier (Paris, Gauthier-Villars).—L'Eclairage: Eclairage aus Gaz, &c.: Prof. J. Lefèvre (Paris, Gauthier-Villars).—A Text-Book of Histology: A. Clarkson (Bristol, Wright).—Annales de L'Observatoire Météorologique du Mont Blanc, Tome ii. (Paris, Steinheil).—Bulletin of the Philosophical Society of Washington, Vol. xii. (Washington).
PAMPHLETS.—First Records of British Flowering Plants: W. A. Clarke (West).—Casa Grande Ruin: C. Mindeleff (Washington).—Some Analogies in the Lower Cretaceous of Europe and America: L. F. Ward (Washington).—Aboriginal Remains in Verde Valley, Arizona: C. Mindeleff (Washington).

SERIALS.—Scribner's Magazine, February (S. Low).—Journal of the Institution of Electrical Engineers, No. 125, Vol. xxv. (Spon).—Strand Magazine, February (Newnes).—Bulletin of the American Mathematical Society, January (New York, Macmillan).—Proceedings of the Royal Society of Edinburgh, Vol. xxi. No. 3, Pp. 161–248 (Edinburgh).—Physical Review, Part xxii. (Macmillan).—Geographical Journal, February (Stanford).—Proceedings of the Academy of National Sciences of Philadelphia, 1896, Part 2 (Philadelphia).—Bulletin of the U.S. National Museum, No. 47, Part 1 (Washington).—Iowa Geological Survey, Vol. v. (Des Moines).—Journal of the Academy of Natural Sciences of Philadelphia, second series Vol. x. Part 4 (Philadelphia).

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